mactec-ers
MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole # 20-03-11

Borehole Information

Farm : B	**Tank :** B-103	**Site Number :** 299-E33-188
N-Coord : 45,478	**W-Coord :** 52,571	**TOC Elevation :** 651.37
Water Level, ft :	**Date Drilled :** 1/31/1972	

Casing Record

Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 100	

Borehole Notes:

Borehole 20-03-11 was drilled in January 1972 to a depth of 100 ft with 6-in. casing. Data from the drilling log and Chamness and Merz (1993) were used to provide borehole construction information. Although no information concerning grouting or perforations is provided in either of these references, it is assumed that the borehole was not grouted or perforated since this was not a routine practice during the early 1970s drilling campaign. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel tubing.

Equipment Information

Logging System : 1B	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 02/1997	**Calibration Reference :** GJO-HAN-14	**Logging Procedure :** P-GJPO-1783

Logging Information

Log Run Number :	1	**Log Run Date :**	09/09/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	0.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	16.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	09/11/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	100.5	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	21.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	3	**Log Run Date :**	09/12/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	22.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	15.0	**MSA Interval, ft. :**	0.0	**Log Speed, ft/min.:**	n/a

Log Event A

Borehole 20-03-11

Log Run Number :	4	**Log Run Date :**	09/12/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	7.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	27.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged by the SGLS in four log runs. Three log runs were required to log the borehole. An additional log run was performed to repeat an interval of the borehole as a quality check. The top of the borehole casing, which is the zero reference for the SGLS, is approximately 0.5 ft above the ground surface. The total logging depth achieved was 100.5 ft.

Analysis Information

Analyst : E. Larsen

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 04/15/1998

Analysis Notes :

The pre-survey and post-survey field verification for each logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the accepted calibration spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

A casing correction factor for a 0.280-in.-thick steel casing was applied to the concentration data during the analysis process.

Shape factor analysis was applied to the SGLS data and provides insights into the distribution of Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

The interval between 7 and 27 ft was relogged as a quality assurance measure to establish the repeatability of the radionuclide concentration measurements. A separate log plot showing the radionuclide concentrations that were calculated using separate data sets provided by the original and rerun logging runs is included.

Borehole 20-03-11

Log Event A

A plot of the shape factor analysis results is also included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

Results/Interpretations:

The man-made radionuclide Cs-137 was detected in this borehole. The Cs-137 contamination was measured nearly continuously from the ground surface to a depth of 21.5 ft. Isolated occurrences of Cs-137 were detected at 29 ft, from 49.5 to 50 ft, and at the bottom of the logged interval (100.5 ft).

Most of the U-238 concentration values were absent from the ground surface to 1.5 ft and 3.5 to 8 ft. Elevated, slightly variable K-40 concentration values occur from 46 to 73 ft. The K-40 concentrations increase slightly from 73 to 74 ft and become moderately variable and remain elevated to the bottom of the logged interval.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank B-103.